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NASA TECH BRIEF

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Rugged, Low-Conductance, Heat-Flow Probe

A newly developed heat-flow probe combines ruggedness high precision, accuracy, and stability. The device can withstand vibration, shock, acceleration, temperature extremes, and high vacuums, and should interest geologists, meteorologists, oceanographers, and industrial engineers.

The probe structure has low thermal conductance to enable accurate measurement of slight temperature gradients. The probe is lightweight, and is compact when folded for shipment. When the two 21-in. sections are joined by a coiled spring, the total length of the unit is 43 in.

The sections each contain a gradient sensor bridge and a ring sensor bridge for measuring temperature. Each section is made of filament-wound epoxy fiberglass, with a three-piece outer sheath housing the temperature sensors and angular spacers and an inner sheath containing the wiring connecting the sensors.

The sensors are mounted on the outer sheath such that strain-free differential expansion is permitted while sufficient mechanical strength is retained. The guards around the sensors protect them during handling but permit the exchange of radiation between the sensors and the surroundings. Alignment springs over the sensors align the probe in a borehole, and a standoff spring cushions the lowered probe and keeps it clear of the borehole bottom.

The probe is blackened with a thermal-control paint to aid radiative heat transfer. Two radiation shields protect the probe from direct sunshine: the lower one, at the top of the probe, is a disk of aluminized polytetrafluoroethylene with a foam spacer; the upper one, covering the mount of the borehole, is an aluminized composite of nylon fabric and polytetrafluoroethylene.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
Manned Spacecraft Center, Code BM7
Houston, Texas 77058
Reference: TSP70-10622

Patent status:

No patent action is contemplated by NASA.

Source: John E. McCullough, Richard B. Hinckley, Robert M. Lucas, and Edward J. Boudreau of Arthur D. Little, Inc. under contract to Manned Spacecraft Center (MSC-13443)

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